Analysis of dose distribution in HDR endobronchial brachytherapy in 2D and 3D methods with the use of three-dimensional images

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Methods
Conducted examination concerns patients diagnosed with non-small cell lung cancer, receiving palliative care in the Brachytherapy Department between 2011 and 2013. The treated group consisted of 31 patients. Treatment process have been based on 3D planning method for all patients. Firstly, the coverage of the PTV parameter in 2D for V85, V100 and V115 has been analysed. Then, the dosage that the critical organs would take in, both methods have been evaluated. In cases of heart, spinal cord and oesophagus, the examined dosage equalled D0,1cm³, D1cm³ and D2cm³ for each of the structures. Also the heart D20 has been examined as well as D5 for the healthy lung. The number of applied applicators have been evaluated in reference to the volume target.

Results
When analysing the charts comparing both methods, for the target area we can observe that in each case in 3D method – 50% of middle results are situated higher on the chart than in 2D method. This proves much higher degree of PTV coverage in 3D method. In all of the evaluated OAR volumes, doses were higher in the 3D method then in the 2D one. When analysing the comparison of OAR for both methods on box-plots we can see that the differences are not as significant as when comparing both methods for PTV. Based on completed analysis of OAR dosage in 2D and 3D methods, we learn that critical organs have received only slightly higher doses in the 3D method compared to the 2D.

Conclusions
- Differences in dose median between 3D and 2D methods in HDR endobronchial brachytherapy for PTV amounted to 43,33% for V85, for V100 44,08%, whereas for V115 reached the value if 43,67% in favor of three-dimensional imaging planning method;
- The patient’s survival time for the 3D method was 21 months and the 2D method was 5 months.